Calculus 1 Workbook

Exponential growth and decay

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MATH

HALF LIFE

- 1. Find the half-life of Tritium if its decay constant is 0.0562.

- 2. Find the half-life of Cobalt-60 if its decay constant is 0.1315.

- 3. Find the half-life of Berkelium-97 if its decay constant is 0.000503.

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NEWTON'S LAW OF COOLING

■ 1. A cup of coffee is $195°$ F when it's brewed. Room temperature is $74°$ F. If the coffee is $180°$ F after 5 minutes, to the nearest degree, how hot is the coffee after 25 minutes?

■ 2. A boiled egg that's $99°$ C is placed in a pan of water that's $24°$ C. If the egg is $62°$ C after 5 minutes, how much longer, to the nearest minute, will it take the egg to reach $32°$ C.

■ 3. Suppose a cup of soup cooled from $200°$ F to $161°$ F in 10 minutes in a room whose temperature is $68°$ F. How much longer will it take for the soup to cool to $105°$ F?

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COMPOUNDING INTEREST

■ 1. Suppose you borrow $\$15{,}000$ with a single payment loan, payable in 2 years, with interest growing exponentially at $1.82\,\%$ per month, compounded continuously. How much will it cost to pay off the loan after 2 years?

■ 2. Your parents deposit $\$5{,}000$ into a college savings account, with interest growing exponentially at $0.875\,\%$ per quarter, compounded continuously. How much will be in the account after 18 years?

■ 3. Suppose you win $\$50{,}000$ in a contest and you decide to save it for your retirement. You deposit it into an annuity account that pays $2.4\,\%$ semi-annually, compounded continuously. How much will the account contain after 25 years, when you plan to retire?

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SALES DECLINE

■ 1. Suppose a pizza company stops a special sale for their three-topping pizza. They will resume the sale if sales drop to $70\,\%$ of the current sales level. If sales decline to $90\,\%$ during the first week, when should the company expect to start the special sale again?

■ 2. Suppose a donut store experiments with raising the price of a dozen donuts to see if sales are affected. They'll resume the sale if sales drop to $80\,\%$ of the current sales level. If sales decline to $90\,\%$ after two weeks, when should the store change back to the original price?

■ 3. Suppose a flower shop decides to stop ordering roses in the winter time to see if sales are affected. They will resume the sale if sales drop to $90\,\%$ of the current sales level. If sales decline to $96\,\%$ after three weeks, when should the shop begin ordering roses again?

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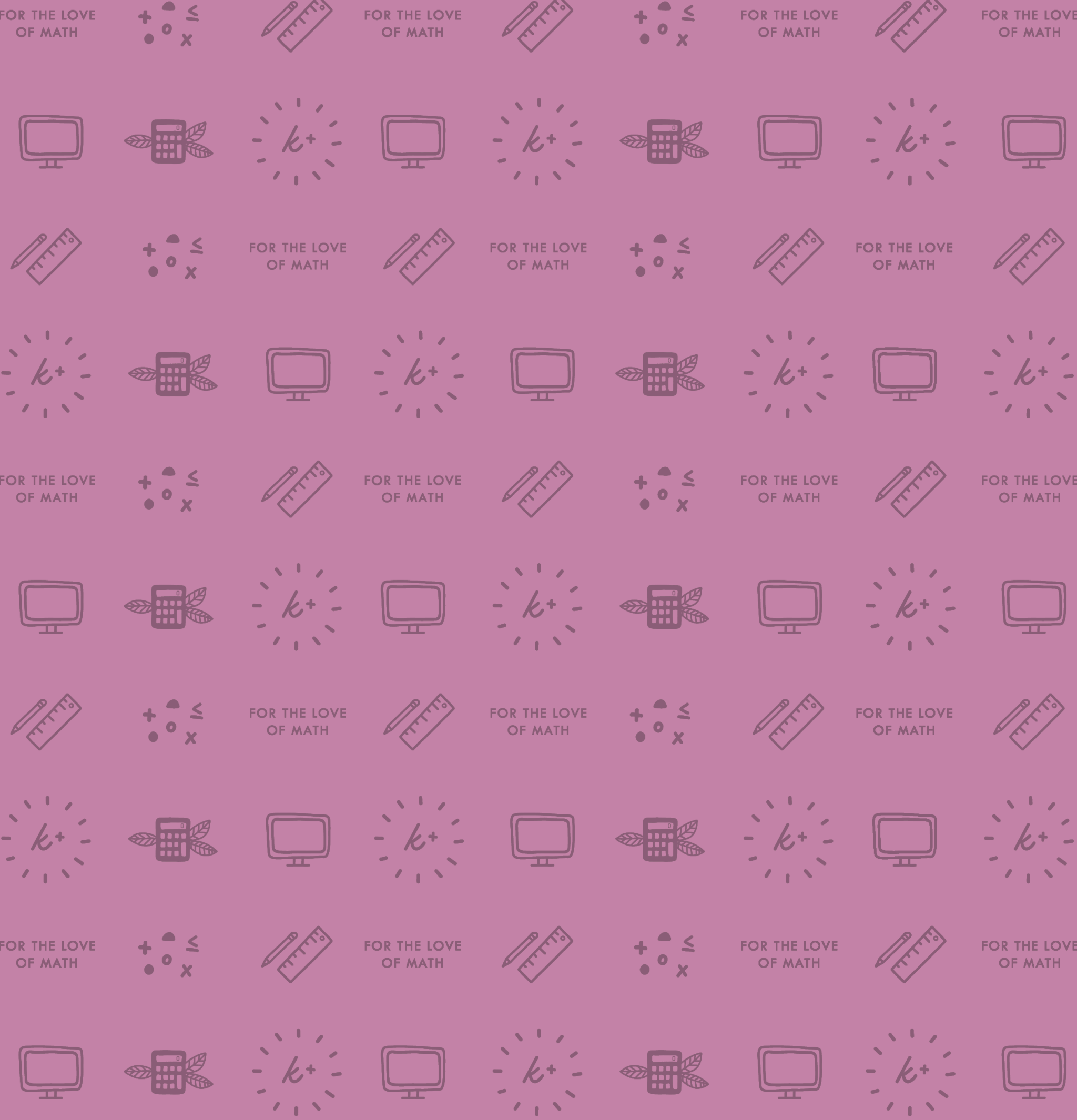

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